

## Neutral Transport in SOL Plasma: Markovian Beta process to describe plasma density and temperature fluctuations

A. Mekkaoui<sup>1\*</sup>, Y. Marandet<sup>1</sup>, J. Rosato<sup>1</sup>, D. Reiter<sup>2</sup>, M. Koubiti<sup>1</sup>, R. Stamm<sup>1</sup>,  
H. Capes<sup>1</sup>, L. Godbert-Mouret<sup>1</sup>

<sup>1</sup> *PIIM, CNRS/Université de Provence Centre de Saint Jérôme  
Marseille F-13397 Cedex 20, France*

<sup>2</sup> *IEF-4 Plasmaphysik Forschungszentrum Jülich GmbH  
TEC Euratom association, D-52425 Jülich, Germany*

*\*Email: samad.mekkaoui@piim.up.univ-mrs.fr*

Improving the description of the far scrape-off layer (SOL) in current edge code suites such as SOLPS [1] is the subject of current efforts e.g. [2] given the importance of main chamber plasma wall interactions (first wall recycling and sputtering) in the design and operation of tokamaks. One of the specific features of the far SOL is the large amplitude of turbulent fluctuations [3]. Neutral particles (atom and molecules) are affected by these fluctuations through the rates of atomic physics processes [4,5]. Consistently with experimentally measured PDF (probability density function) of both the plasma density and temperature [6],  $n$  and  $T$  are modeled using a Markovian Beta processes [7], for which the spatial correlation function can be set to match measurement [8] and/or calculations [9]. This allows one to consider plasmas fluctuations with positive or negative skewness respectively corresponding to depletion or excess of plasma density, which was not possible with Gamma statistics used up to now [10], as these have intrinsically positive skewness. The effects of plasma fluctuations on the neutral penetration depth, the neutral charge exchange flux, the ionization source, as well as Beryllium and Carbon sputtering yield are assessed and compared with results of both the obtained from the free turbulence and the Gamma statistics plasma.

- [1] R. Schneider et al., Contrib. Plasma. Phys. **46** (2006) 191
- [2] W. Dekeyser et al., J. Nuc. Mater. In Press (2010)
- [3] J. A. Boedo, J. Nuc. Mater. **390** (2009) 29
- [4] S. I. Krasheninnikov et al., Phys. Plasmas. **16** (2009) 014501
- [5] Y. Marandet et al. Plasma Phys. Control. Fus. **53** (2011) 065001
- [6] B. Labit et al., Phys. Rev. Lett. **98** (1996) 255002
- [7] E. McKenzie, Manag. Sci. **31** (1996) 988
- [8] A. Huber et al., Plasma Phys. Control. Fus. **47** (2005) 409
- [9] Y. Sarazin, P. Ghendri, Phys. Plasmas. **5** (1998) 4214
- [10] Y. Marandet et al., Contrib. Plasma. Phys. **50** (2010) 279